~~25~~ 366/106

1965

996195 PROVISIONAL SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheets 1 & 2

FIG. 2.

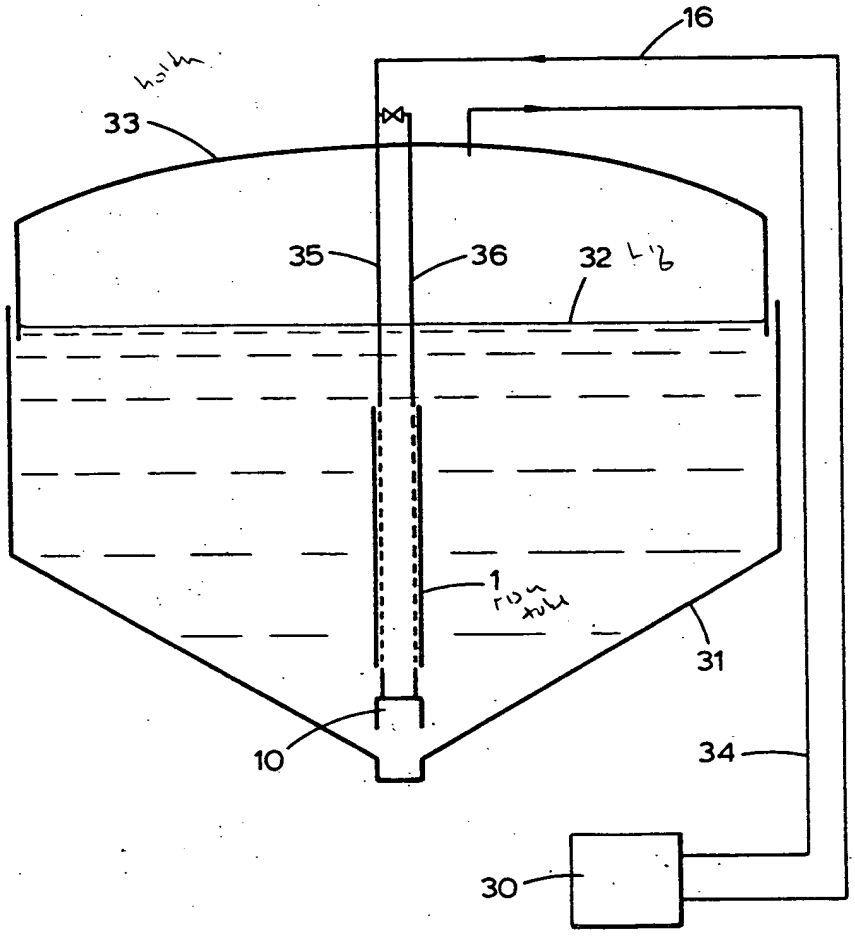
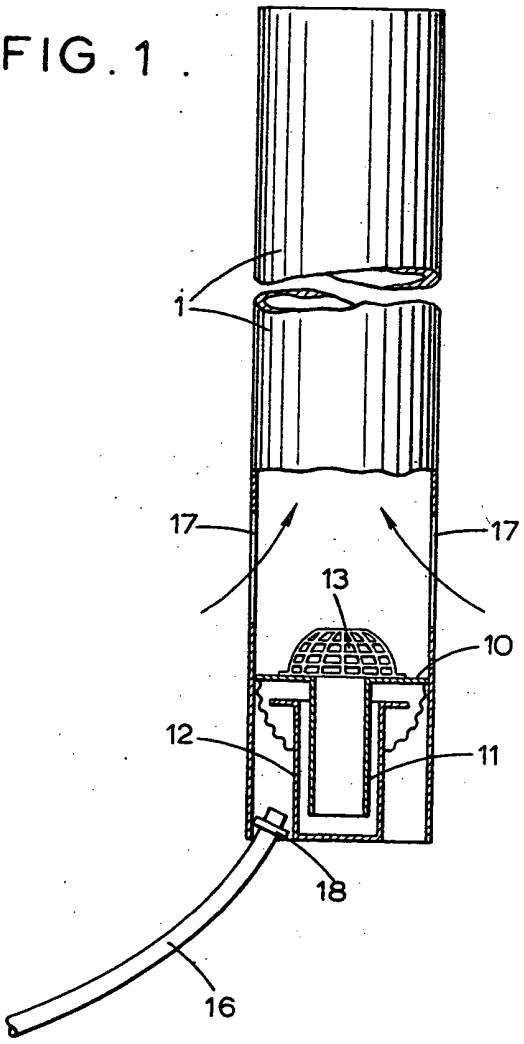


FIG. 1.



996,195

PATENT SPECIFICATION

996,195

DRAWINGS ATTACHED

Inventor: ALEC HIBBURD LAURIE

Date of filing Complete Specification: Nov. 5, 1962.

Application Date: Aug. 3, 1961. *No. 28279/61.*

Complete Specification Published: June 23, 1965.

Index at acceptance:—B1 C(4, 18A1, 18A4); F1 R1

Int. Cl.:—B 01 f // F 05 d

COMPLETE SPECIFICATION

Improvements in methods and apparatus for Mixing and Dispersing Substances and for Maintaining Dispersions and Emulsions

We, AERO HYDRAULICS LIMITED (formerly Pneumatic Breakwaters Limited), a Body Corporate duly organised under the Laws of Great Britain, of 10 Upper Grosvenor Street, London, W.1, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to apparatus for destratifying liquids, mixing liquids, or liquids and solids, and for the maintenance of dispersions or suspensions or of emulsions of two or more disparate liquids. The word "liquid" when hereafter employed is intended to embrace such mixtures, dispersions or suspensions.

In our Specification No. 805789 there is described an apparatus for reducing sea waves by generating turbulence in the ambient water. The method employed consists in the intermittent emission of large bubbles from apparatus located at the sea bed, the said large bubbles rising through the water and creating substantial eddies and turbulence during their ascent to the surface. An embodiment of suitable apparatus for producing large intermittent bubbles is described, in which the air or gas is fed continuously into a storage chamber until a predetermined volume is stored and is reached whereupon a siphon action takes place resulting in the discharge of the stored gas in the form of one or more large bubbles.

In our co-pending Application No. 36867/59 (Serial No. 967543) an improvement in and relating to the above apparatus is described whereby the wave reducing properties of turbulence in the water are enhanced by being concentrated into the upper layers of the water. Such apparatus comprises a distributor or emitter, which is of the form described in the aforementioned Specification No. 805789 which is located at the base of a tube or conduit of large diameter in such manner that the bubbles intermittently discharged from the emitter when fed with compressed air or gas pass into and up the tube which is ported or otherwise apertured to enable water or other liquid to be entrained by the bubbles and lifted during their ascent of the tube so transmitting the water or liquid from the lower levels to the level at about which the head of the pipe is situated.

The present invention provides apparatus for destratifying liquids, mixing liquids, or liquids and solids, and for the maintenance of dispersions, suspensions or emulsions of two or more disparate liquids comprising a container for the liquid, an open-ended riser tube or conduit, means securing the lower end of the conduit to the base of the container, the conduit having its upper end at or below the surface of the liquid, an emitter or distributor disposed at the lower end of the riser tube, means for supplying compressed air or gas to said emitter and said emitter being capable of intermittently discharging such air or gas into the lower end of the conduit in the form of large bubbles which substantially fill the entire cross-section of the conduit, and including ports or apertures in the wall of the conduit immediately above the emitter so as to permit the contents of the container to be entrained by the bubbles and lifted during the ascent of the bubbles up the conduit, so that said entrained liquid is discharged through the open upper end of said conduit.

Preferably the emitter or distributor is comprised by a siphonic ejector as described and claimed in the aforementioned Patent Specification No. 805789.

In a specific embodiment of apparatus intended for mixing, circulating or emulsifying the contents of a container such as a vat or tank, the riser tube or conduit is of plastic,

[*Price 4s. 6d.*]

metal, concrete or other suitable material some 6 to 30 inches in diameter, the length depending on the depth of the container and the diameter on the duty to be performed. The riser tube or conduit may if required form part of the structure of the container, and may assist inter alia in supporting a roof of said container. The lower end of the tube is secured at or near the bottom of the container. The tube with its siphonic emitter may be installed singly or in plurality in a tank according to the circumstances and to the degree to which it is desirable to circulate or mix the contents of such tank.

Supply lines connect the siphonic emitter or emitters to a common source of compressed air or gas.

By utilising at the foot of the riser tube or conduit a siphonic emitter, which intermittently releases large bubbles which substantially fill the entire cross-section of the conduit, the maximum volume of liquid is entrained and lifted during the ascent of the bubbles to the head of the conduit situate at or below the surface of the liquid.

Furthermore, bubbles of such diameter ascending do not generate detached eddies in the liquid rising in the conduit, and consequently there is considerably less frictional loss than would be the case if a plurality of small bubbles were released, and the mechanical efficiency of the device is thereby correspondingly improved.

The invention will be further described with reference to the drawing accompanying the Provisional Specification in which:

Figure 1 is a side elevation partly in section of the riser tube and emitter, and to the accompanying drawing in which

Figure 2 is a diagrammatic view of a mixing container according to one embodiment of the invention.

Referring first to Figure 1, 1 represents a riser tube or conduit, suitably of polythene, 12 inches diameter and 20 feet long, and open at both ends.

10 generally designates a siphonic emitter according to our Patent No. 805789 at the bottom end of the tube 1, such emitter having an inner depending tube 11 and a concentric siphon tube 12, the emitter being furnished with a protective grid or grill 13.

16 is a supply line from a suitable source of compressed air or gas (not shown) opening into the annular space surrounding the siphon tube 12 at the bottom of the tube 1, and 17 are large ports in the wall of such tube immediately above the emitter 10.

The mouth of the supply line 16 is secured by a clip 18 to the inner wall of the tube 1.

In the embodiment shown in Figure 2, 30 is a fan or compressor, 31 a storage tank containing liquid the surface of which is shown at 32, and 33 a gas-holder roof to the tank. Gas collecting in the holder 33 is being drawn out through a pipe 34, recirculated by the fan 30 and returned to the emitter 10 by way of the supply line 16.

Also in this embodiment the supply line 16 has a portion 35 and 36 depending through the roof 33 and inside the riser tube 1, so that the tube 1 together with the siphonic emitter 10 may be raised by lifting the pipes 35 and 36. For this purpose the emitter 10 may be adjustably anchored to the bottom of the container 31.

In operation, large bubbles of an appropriate size in relation to the diameter of the conduit and that substantially fill its bore, are intermittently ejected by the siphonic emitter 10. Taking the progress of a single large bubble by stages, the large bubble is discharged from the emitter 10 and rises in the tube 1 and, in so doing, takes on the properties of a piston. The bubble rises past the windows or ports 17 and proceeds upwards, pushing liquid ahead of itself, and entraining further liquid through the ports in its rear. Such liquid, impelled by the bubble is discharged at high velocity through the upper open end of the tube.

The gas supply to the emitter 10 is controlled so that there is always at least one large bubble in transit up the tube 1, and by this means a steady discharge of liquid at the top of the tube is secured.

WHAT WE CLAIM IS:—

1. Apparatus for destratifying liquids, mixing liquids, or liquids and solids, and for the maintenance of dispersions, suspensions or emulsions of two or more disparate liquids comprising a container for the liquid, an open ended riser tube or conduit, means securing the lower end of the conduit to the base of the container, the conduit having its upper end at or below the surface of the liquid, an emitter or distributor disposed at the lower end of the riser tube, means for supplying compressed air or gas to said emitter and said emitter being capable of intermittently discharging such air or gas into the lower end of the conduit in the form of large bubbles which substantially fill the entire cross-section of the conduit, and including ports or apertures in the wall of the conduit immediately above the emitter so as to permit the contents of the container to be entrained by the bubbles and lifted during the ascent of the bubbles up the conduit so that said entrained liquid is discharged through the open upper end of said conduit.

2. Apparatus according to claim 1, wherein the distributor or emitter is comprised by a siphonic ejector as described and claimed in Specification No. 805789.

3. Apparatus according to either of the preceding claims 1 or 2, wherein the air or gas line or lines to the emitter pass down inside the conduit or riser pipe.

4. Apparatus according to any of the pre-

THIS PAGE BLANK (USPTO)

ceding claims 1 to 3, in which the container for the liquid is equipped with a telescopic gas-holder roof adapted to retain a body of air or gas above the surface of the liquid in the container.

5. Apparatus according to any of the preceding claims, wherein supply line or lines for feeding compressed air or gas to the distributor or emitter is/are associated with means by which it/they can be lifted or lowered to raise or lower the emitter together with its superposed conduit, and wherein the means securing the lower end of the conduit to the base of the container are such as to permit such raising or lowering.

6. Apparatus according to any of the preceding claims, wherein a plurality of conduits each with its own distributor or emitter are installed in a single container.

7. Apparatus according to claim 6, wherein supply lines connect the respective emitters to a common source of compressed air or gas.

8. Apparatus according to any of the preceding claims, wherein the or each riser tube or conduit has a bore which is 6 to 30 inches in diameter.

9. Apparatus constructed and arranged substantially as described with reference to either the drawings accompanying the Provisional Specification or the accompanying drawing.

10. A method of mixing or treating liquids which involves the use of the apparatus claimed in any of the preceding claims.

11. A method of mixing or treating liquids which involves the use of the apparatus substantially as described with reference to and as shown in either the drawing accompanying the Provisional Specification or the accompanying drawing.

O'DONNELL, LIVSEY & CO.,
Chartered Patent Agents,
47 Victoria Street, London, S.W.1.
Agents for Applicants.

Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press (Leamington) Ltd.—1965. Published by The Patent Office, 25 Southampton Buildings, London, W.C.2, from which copies may be obtained.